Figure 1. Local Area Network
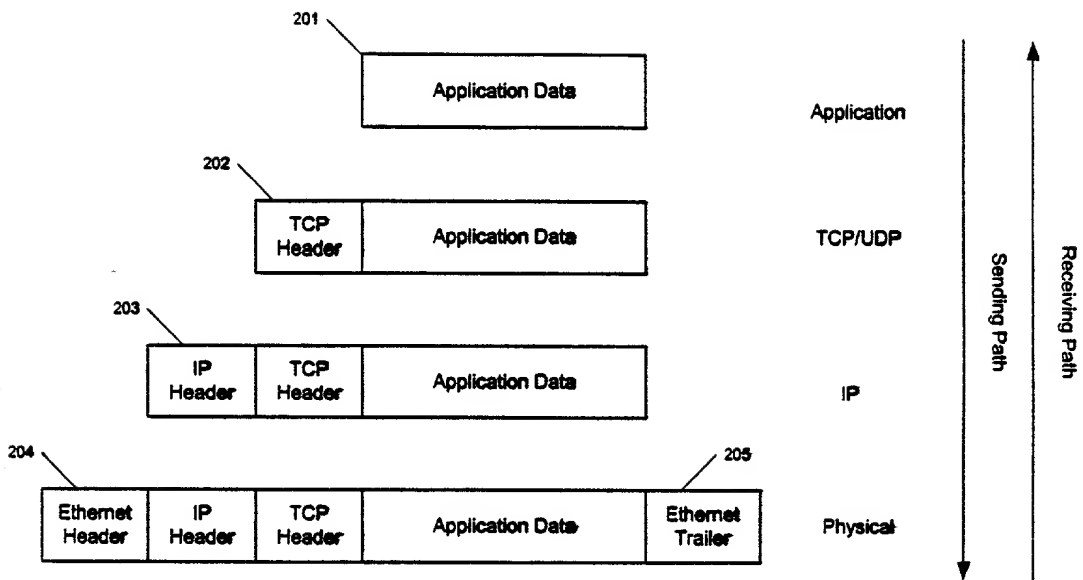
106

Link to other
networks

105

104

101c

General
Purpose
Computer

101b

101a

102b

Storage
Device

102a

103b

Specialized
Appliance

103a

201

Application Data

Application

202

TCP Header	Application Data

TCP/UDP

203

IP Header	TCP Header	Application Data

IP

204   205

Ethernet Header	IP Header	TCP Header	Application Data	Ethernet Trailer

Physical

Sending Path

Receiving Path

Figure 2. TCP/IP Network Protocol Stack (without SSL)

300

301

Application Data
(plain text)

Application   308

306   307

| SSL Header | Application Data (encrypted) | MAC |

SSL Layer   309

302

| TCP Header | SSL Header | Application Data (encrypted) | MAC |

TCP/UDP   310

303

| IP Header | TCP Header | SSL Header | Application Data (encrypted) | MAC |

IP   311

304   305

| Ethernet Header | IP Header | TCP Header | SSL Header | Application Data (encrypted) | MAC | Ethernet Trailer |

Physical   312

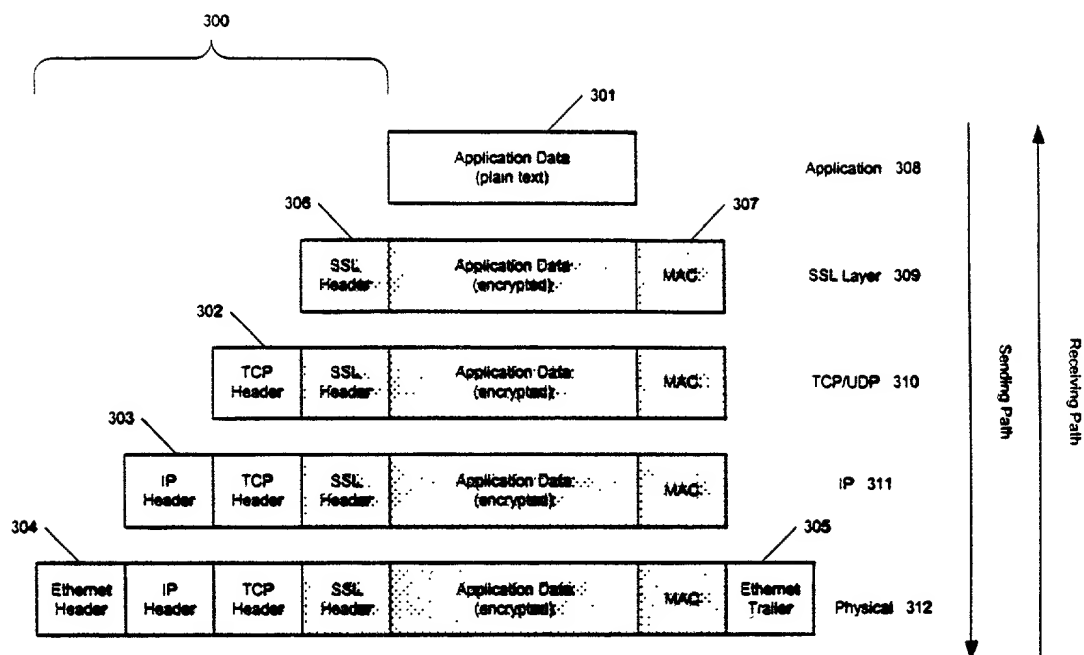Sending Path

Receiving Path

Figure 3. TCP/IP Network Protocol Stack with SSL
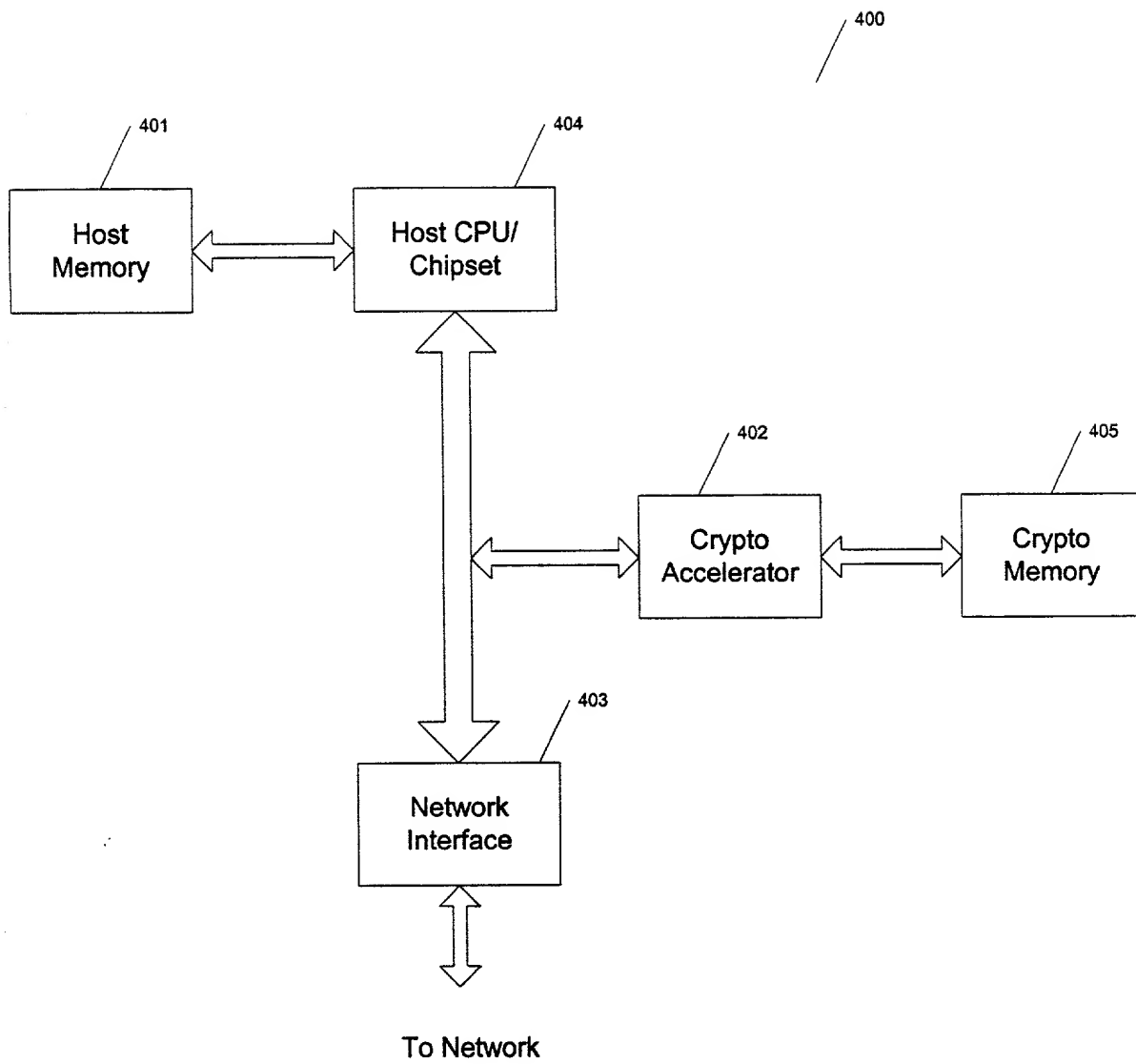
Figure 4. Existing SSL Acceleration Devices

Figure 5a (Outgoing data processing)

501a — Receiving outgoing application data from the host

↓

502a — Copying outgoing application data into Crypto Memory

↓

503a — Performing SSL processing (Encryption/Authentication)

↓

504a — Copying encrypted application data back to host memory

↓

505a — Performing TCP/IP processing in the host memory by host CPU

↓

506a — Sending IP packets to network interface by the host

↓

Network Interface

Figure 5a. Outgoing data processing

Figure 5b (Incoming data processing)

506b — Sending application data to the system

↑

505b — Copying application data back to host memory

↑

504b — Performing SSL processing (Decryption/Authentication)

↑

503b — Copying application data into Crypto Memory

↑

502b — Performing TCP/IP processing in the host memory by host CPU

↑

501b — Receiving IP Packets from network interface
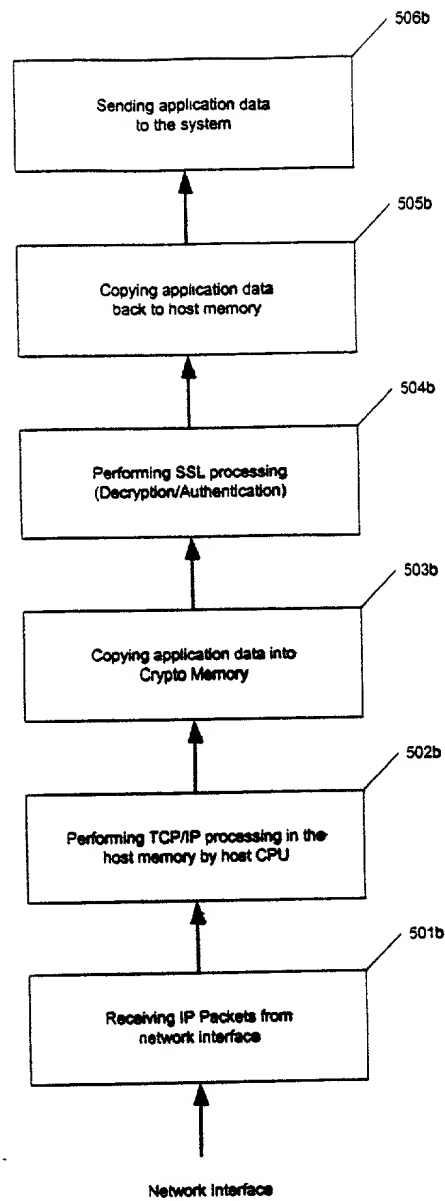
↑

Network Interface

Figure 5b. Incoming data processing
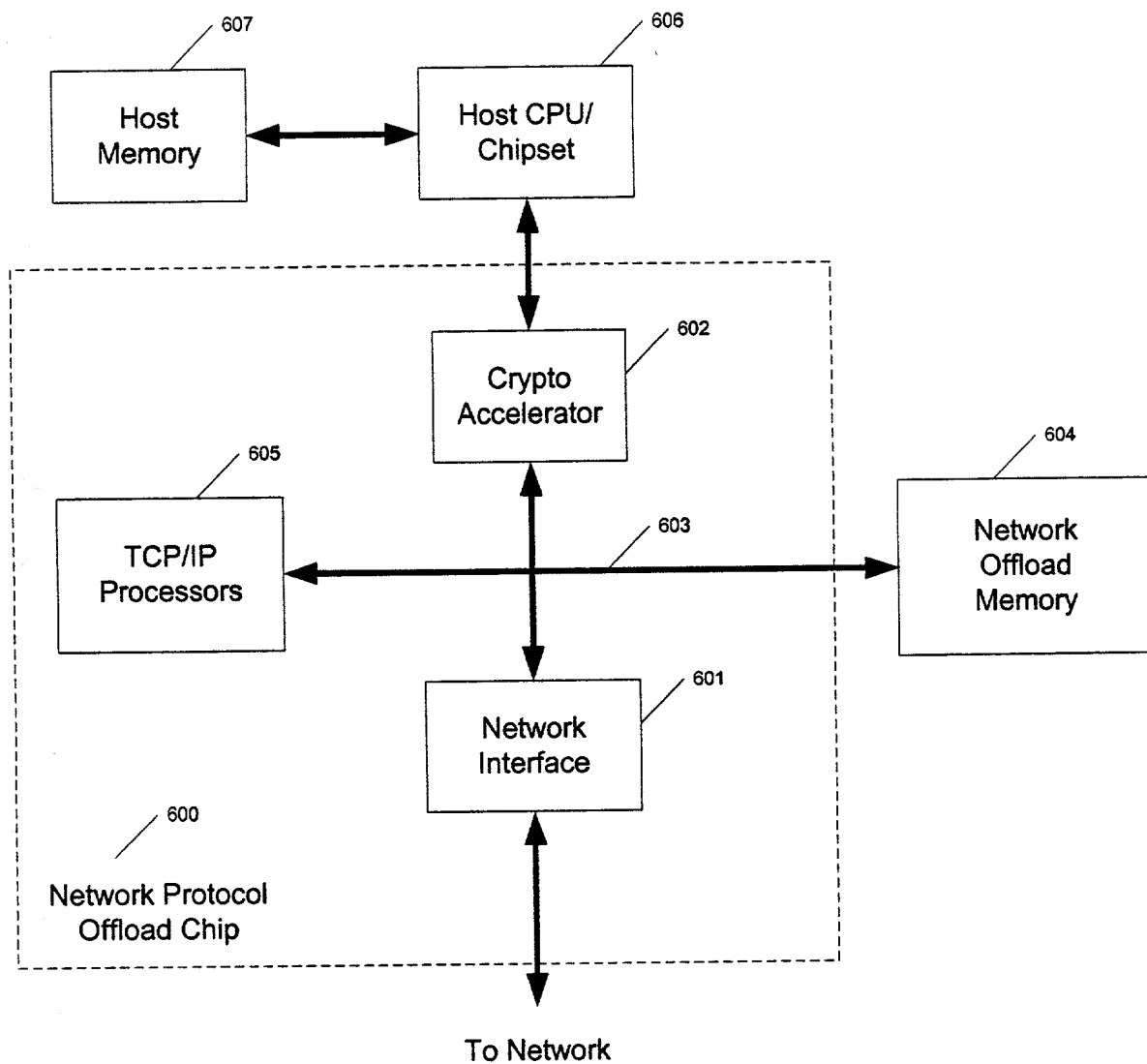
Figure 6. SSL Acceleration Devices

Figure 7a — Outgoing Data Processing

```
┌─────────────────────────────────┐
│   Receiving Application data from│   701a
│            host                  │
└─────────────────────────────────┘
              │
              ▼
        ╱──────────────╲             703a
       ╱ SSL processing  ╲────── No
       ╲  is required ?  ╱
        ╲──────────────╱
              │ Yes
              ▼
┌─────────────────────────────────┐
│  Transferring data to Crypto     │   704a
│       Accelerator device         │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│     Performing SSL processing    │
└─────────────────────────────────┘   705a
              │
              ▼
┌─────────────────────────────────┐
│       Transferring data to       │   706a
│  Network Offload Memory (NOM)    │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Performing TCP/IP processing,   │   707a
│       creating IP packets        │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│ Delivering IP packets to network │   708a
│           interface              │
└─────────────────────────────────┘
              │
              ▼
```

Figure 7a. Outgoing Data Processing

Figure 7b — Incoming Data Process

```
┌─────────────────────────────────┐
│    Receiving IP packets at       │   701b
│        Network Interface         │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│    Transferring IP packets to    │   702b
│ Network Offload Memory (NOM) of  │
│              NPOC                │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│   Performing TCP/IP process on   │   703b
│           IP packets             │
└─────────────────────────────────┘
              │
              ▼
        ╱──────────────╲             704b
       ╱ SSL processing  ╲────── No
       ╲  is required ?  ╱
        ╲──────────────╱
              │ Yes
              ▼
┌─────────────────────────────────┐
│  Transferring data to Crypto     │   705b
│          Accelerator             │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│      Performing SSL process      │   706b
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│      Transferring data to host   │   707b
└─────────────────────────────────┘
              │
              ▼
```
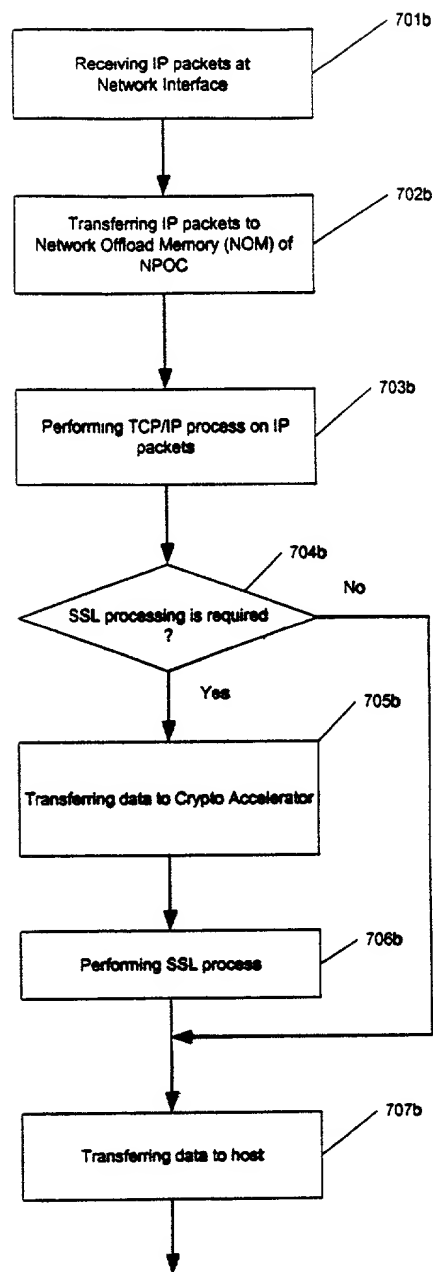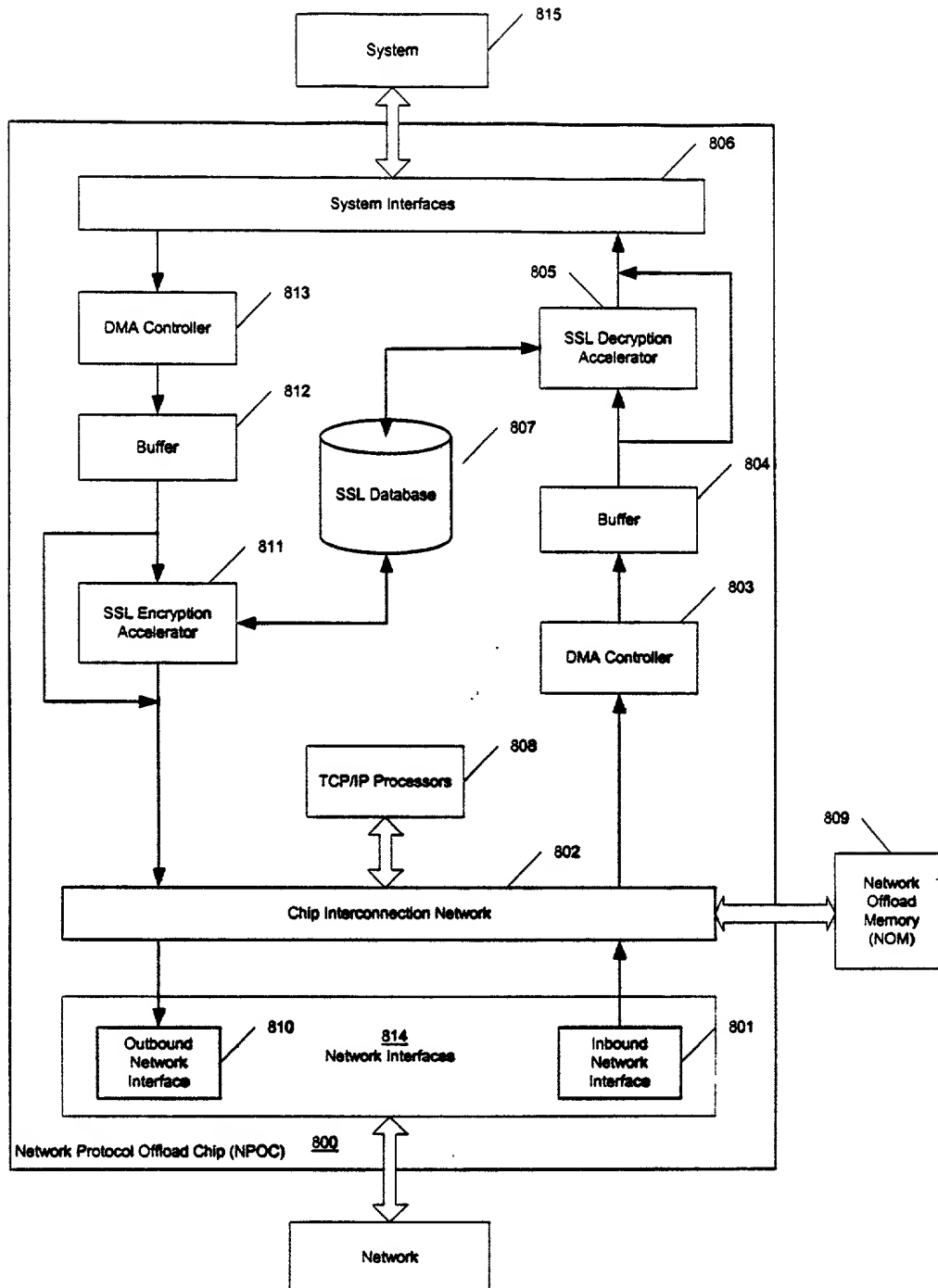
Figure 7b. Incoming Data Process

Figure 8. Detailed Depiction of an Embodiment
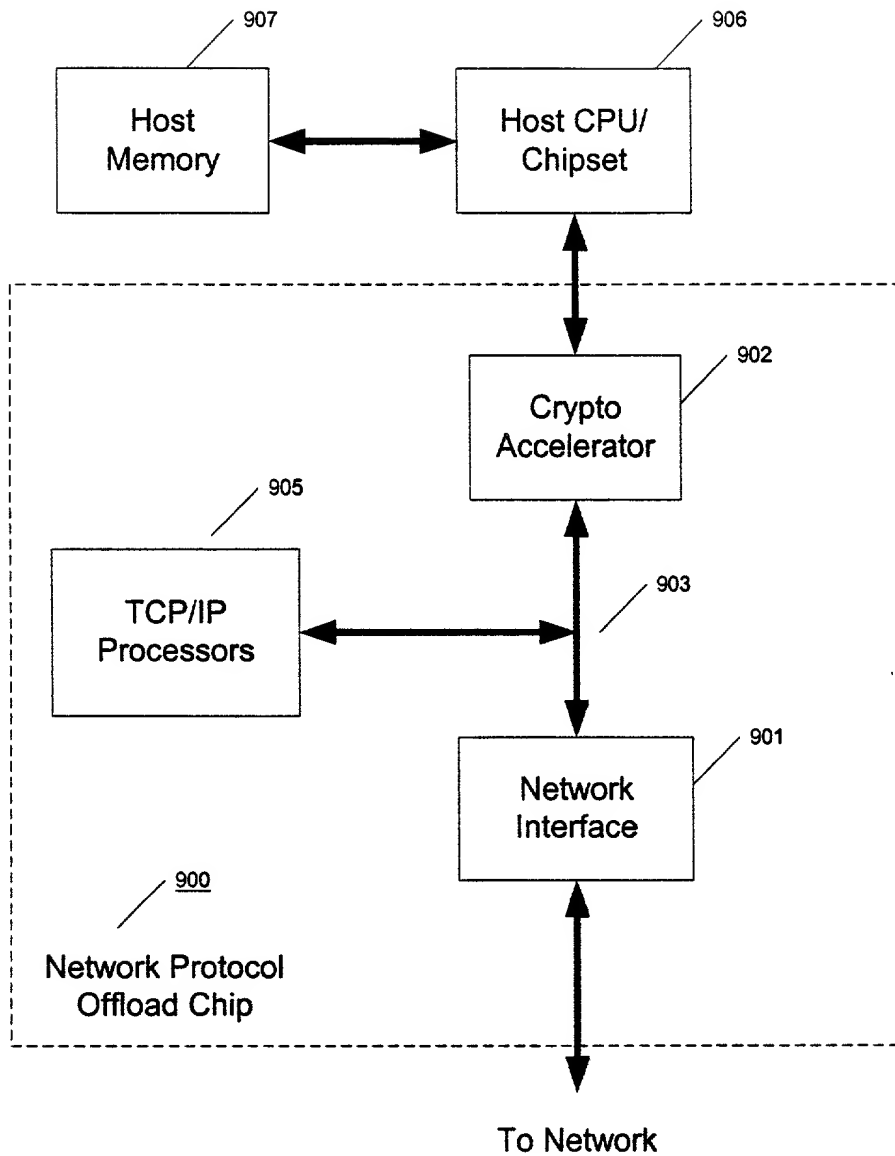
Figure 9. SSL Acceleration Devices

Figure 10a. Outgoing Data Process

```
      ┌──────────────────────────┐   1001a
      │ Receiving application data │
      │      from the host         │
      └──────────────────────────┘
                   │
                   ▼
            ╱─────────────╲   1002a
           ╱  SSL processing ╲      No
           ╲  required ?     ╱─────────────┐
            ╲───────────────╱              │
                   │ Yes                   │
                   ▼                       │
      ┌──────────────────────────┐   1003a │
      │   Transmitting data to    │         │
      │     the accelerator       │         │
      └──────────────────────────┘         │
                   │                        │
    1004a          ▼                        │
      ┌──────────────────────────┐         │
      │  Performing SSL processing │         │
      └──────────────────────────┘         │
                   │                        │
                   ◄────────────────────────┘
                   │
                   ▼
      ┌──────────────────────────┐   1005a
      │  Performing TCP/IP         │
      │      processing            │
      └──────────────────────────┘
                   │
                   ▼
      ┌──────────────────────────┐   1006a
      │ Transmitting IP packets to │
      │    the network interface   │
      └──────────────────────────┘
```

Figure 10a. Outgoing Data Process

Figure 10b. Incoming Data Process

```
      ┌──────────────────────────┐   1006b
      │ Transmitting application   │
      │    data to the host        │
      └──────────────────────────┘
                   ▲
      ┌────────────┤
      │            │
      │   ┌──────────────────────────┐   1005b
      │   │  Performing SSL processing │
      │   └──────────────────────────┘
      │            ▲
      │   ┌──────────────────────────┐   1004b
      │   │ Transmitting IP packets to │
      │   │     the accelerator        │
      │   └──────────────────────────┘
      │            ▲
      │           Yes
      │     ╱─────────────╲   1003b
      │ No ╱  SSL processing ╲
      └───╲  required ?     ╱
           ╲───────────────╱
                   ▲
      ┌──────────────────────────┐   1002b
      │  Performing TCP/IP         │
      │      processing            │
      └──────────────────────────┘
                   ▲
      ┌──────────────────────────┐   1001b
      │  Receiving IP packets from │
      │    the network interface   │
      └──────────────────────────┘
```
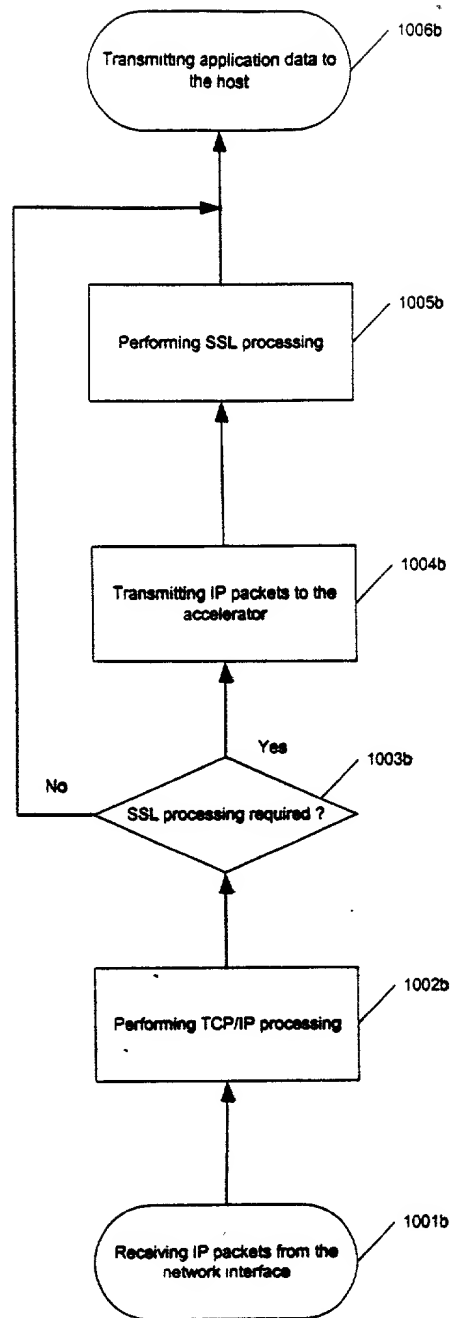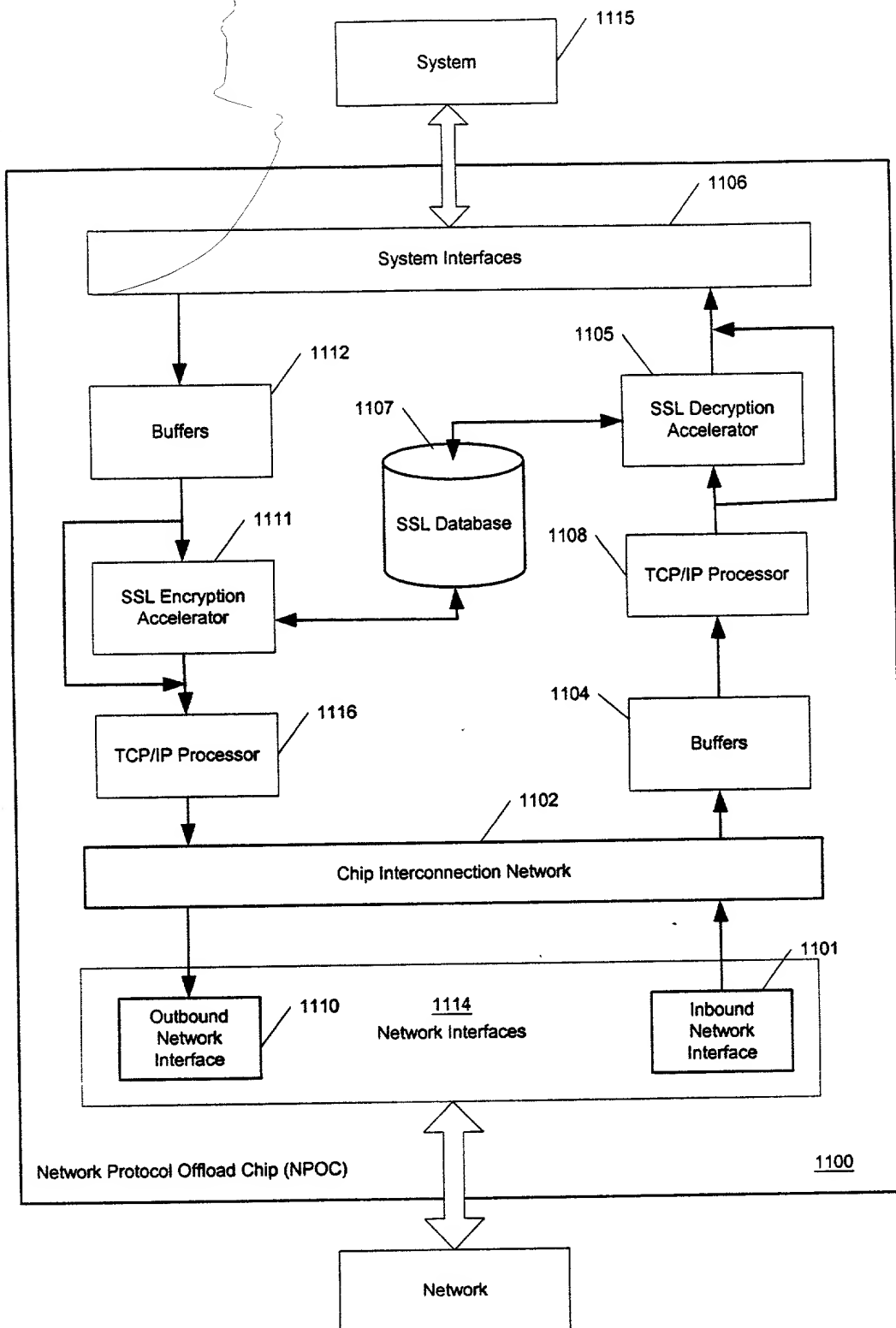
Figure 10b. Incoming Data Process

Figure 11. Detailed Depiction of an Embodiment